Chapter 15

Biocultural Collections and Participatory Methods: Old, Current, and Future Knowledge

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Abstract

Biocultural collections document human–nature interactions through plant and animal-based artifacts, raw materials, herbarium voucher collections, and varied forms of documentation. They form a valuable resource for biocultural conservation, preserving and enhancing traditional knowledge, livelihoods, and the environment. They should be used through participatory methods that allow institutional researchers and local communities to share data on ethnobiological collections and artifacts, enabling new knowledge of plants and people from multiple perspectives. Methods are demonstrated through a case study of historic ethnobotanical specimens collected by Richard Spruce in the northwest Amazon.

Key words Indigenous biocultural knowledge (IBK), Traditional ecological knowledge (TEK), Ethnobiology, Ethnobotany, Brazil

1 Biocultural Collections

Biocultural collections are ethnobiological specimens, artifacts, and documents—plant, animal, and cultural—that represent the dynamic relationships between peoples, biota and environments [1]. They are repositories for plants and animals used by people, products made from them, and information about them, also including objects not made of vegetal or animal material, but used in the processing of these materials. Ethnobiology is a dynamic field that relates processes, transformations and associations, and biocultural collections are therefore more than a "collection of objects." Documentation of provenance, language, images, use, local meanings, processing and ethnographic context, and of interconnections between different forms of specimens, is critically important [2].

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Biocultural specimens can include: herbarium, xylarium and zoological specimens, with label information on use, preparation, common name or other cultural and linguistic information; seeds of plants, fruits, roots, leaves, flowers, bark, tubers, animals, horns, bones, skin, hair, etc.; vegetable and animal products and processes e.g. clothing (vegetable and animal fibers), commercial and medicinal food, religious artifacts, toys, vegetable and animal products (varnish, starch, latex, resins, waxes, oils, essential oils etc.); ethnographic materials and cultural artifacts; DNA collections of useful plants and animals and their wild relatives; living collections (in situ and ex situ collections of plants and animals); archaeological plant and animal remains; biocultural documentation (information from libraries and archives, cultural texts, narratives, field research notes, maps, audios, photo and video files) [1].

Biocultural collections became popular in the mid-nineteenth century, particularly as a means of recording information about plant and animal uses that might be valuable to industrial economies. They were often closely associated with colonial botany. The Museum of Economic Botany at Kew, founded in 1847, was the model for many such museums worldwide. From the 1950s the decline in empire, and rise of oil-based products, led to the closure of most such collections. However, in the last two decades it has become clear that such biocultural collections, whether old or newly formed, can play an important part in the modern work of the ethnobiologist [1].

2 Collaborative Research

Biocultural conservation addresses the loss of biological and cultural diversity. It is grounded in the theory of dynamic and interdependent socio-ecological systems, in the lessons of work on diversity and biocultural heritage, integrated conservation and development, co-management, and community-based conservation [3]. If well used, biocultural approaches to conservation can be a powerful tool to reduce the overall loss of biological and cultural diversity. Biocultural collections are applicable to many aspects of biocultural conservation (Fig. 1).

In the scope of biocultural conservation and biocultural collections, there are important debates on the nature of collaborative processes with local communities [4]. Intercultural collaborative research is complex; it requires a constant dialogue as it articulates diverse epistemic and ontological concepts leading to "co-theorization", facilitating the participation of all researchers in generating "new conceptual tools that make contemporary realities meaningful" [5]. Fortunately, there is substantial experience of community collaboration in conservation and in museum collections on which we can draw [3, 6]. Non-indigenous researchers should be attuned

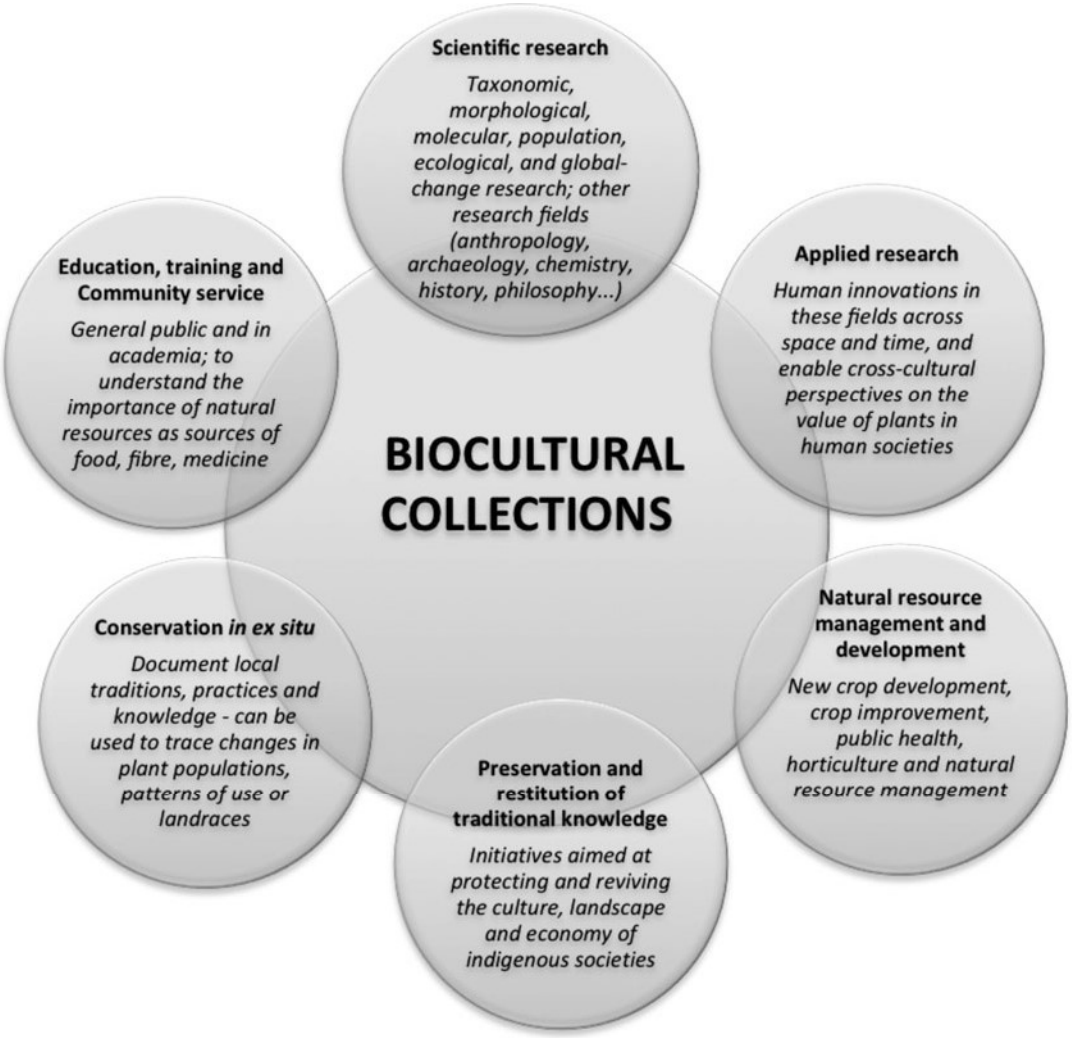

Fig. 1 Biocultural collections serve applied research, plant conservation, animals and traditional knowledge, natural resource management, economic and social development, education and community service. Adapted from [1]

to the necessity of working side-by-side with indigenous participants in all phases of research, beginning with the elaboration of projects, defining themes and objectives, fieldwork (which is not merely data collection), and "space of conceptualization" [5]. Likewise, the coauthoring of work and sharing the resultant benefits are imperative when working with traditional knowledge associated with biodiversity.

3 Case Study: The Northwest Amazon

The Northwest Amazon comprises a large region of equatorial forest on the border of Brazil, Colombia, and Venezuela, which has been inhabited by indigenous peoples since the pre-colonial period. Today they occupy 80% of its area. The region is known as a multiethnic social system comprising about thirty linguistic groups from three linguistic families. The Eastern Tukanoan and Arawak peoples are riparian and farmers, whereas the Maku are more mobile, exploring more dispersed resources in interfluvial areas. This area is characterized by serious ecological limitations: acid soils and waters, nutrient-poor and of low productivity, and extensive areas covered by Amazonian caatinga, which is very restrictive for agricultural practices. These two factors—antiquity of occupation and serious ecological limitations—have led the indigenous peoples to a long process of adaptation, finding effective and sophisticated forms of management of the land, forests and agriculture, fish and game.

Some travellers, like Richard Spruce who visited the region in the nineteenth century, described the vitality and dynamics of these populations, demonstrated by the size of their longhouses, their extensive intercommunal ceremonies, and their rich material culture. This regional social system underlies the constitution of contemporary indigenous organization and of their federation (Federação das Organizações Indígenas do Rio Negro—FOIRN). Major issues include environmental management, community well-being, territorial governance, education, and health care. The use of plant resources is a key priority, both for human livelihoods and the maintenance of ecosystem services. Important and potentially valuable information relevant to this challenge is contained in biocultural collections held both within and outside Brazil. Unlocking this potential requires an integrated, equitable approach to collections research, and the capacity to develop platforms for transmission of information to a wide range of end users.

Beginning in 2015, a collaboration between indigenous peoples in the region and institutions in Brazil and the UK has been based on nineteenth century ethnobotanical specimens, collected by the botanist Richard Spruce, and housed at the Royal Botanic Gardens, Kew and the British Museum (Box 1; Fig. 2) [7, 8]. A diachronic approach to such research facilitates a better understanding of the shifting relationships between people and natural resources, with potentially important implications for the future.

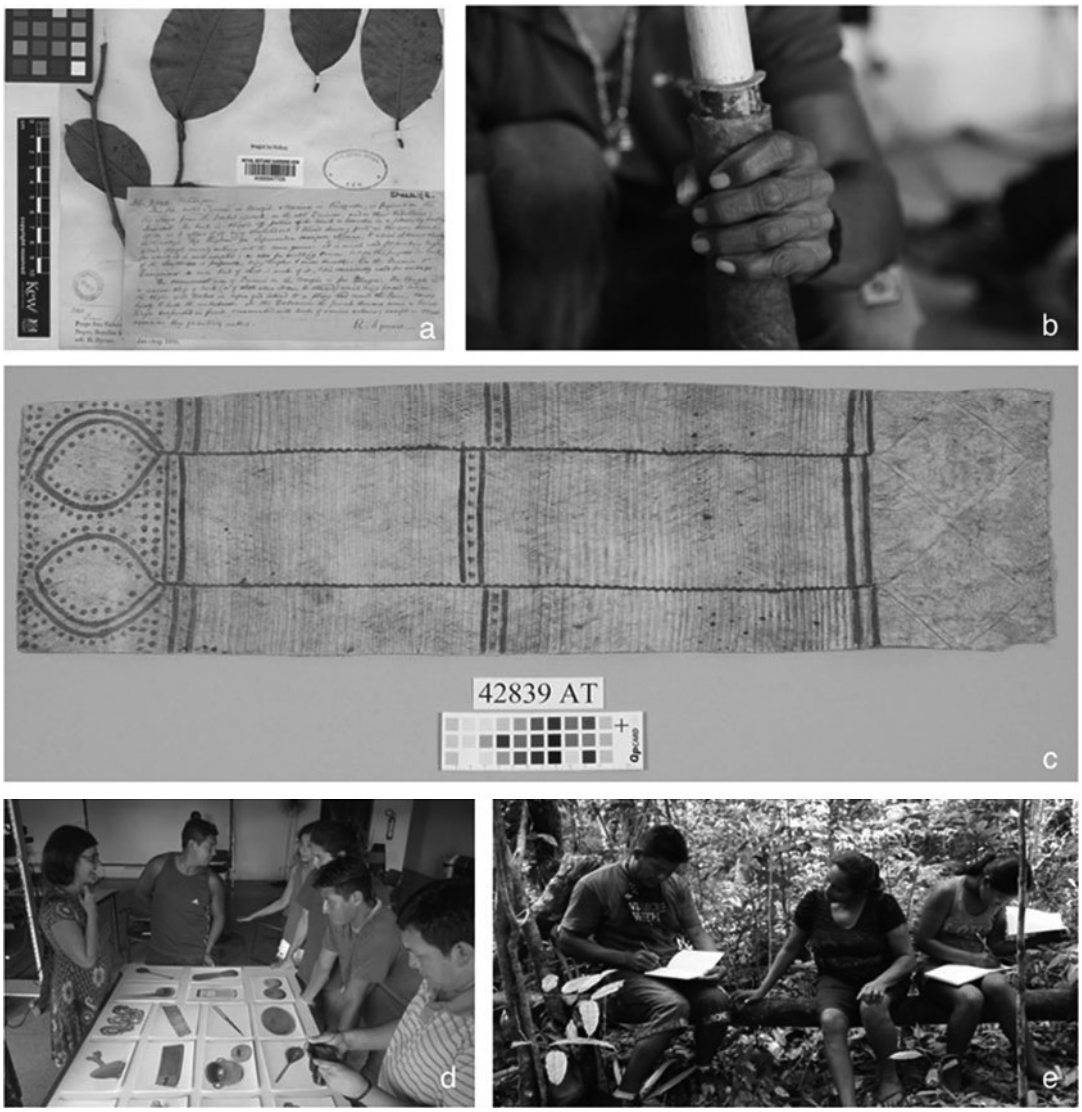

Fig. 2 (**a**) Detail of herbarium specimen of tururi (*Brosimum utile* (Kunth) Pittier), collected by Richard Spruce in São Gabriel da Cachoeira in 1852 (No. 2144; barcode K000947729); (**b**) Demonstration of bark extraction today; (**c**) Tanga made of tururi from the Rio Uaupés, collected by Richard Spruce (EBC 42839); (**d**) Exchanging information about Richard Spruce collections during workshop; (**e**) Practising interviewing in the field. Courtesy of Royal Botanic Gardens, Kew (**a**, **c**); Luciana Martins (**b**, **e**) and Adeilson Lopes da Silva (**d**)

Box 1 Example of a participatory study conducted by Jardim Botânico do Rio de Janeiro (JBRJ), Instituto Socioambiental (ISA), Royal Botanic Gardens, Kew, Birkbeck (University of London), Federação das Organizações Indígenas do Rio Negro (FOIRN) and Museu Paraense Emílio Goeldi (MPEG), supported by Newton Fund (Institutional Skills) from the government of the UK. The activities reported took place in 2016–2017:
Study area—Brazil, Northwest Amazonian, Upper Rio Negro, São Gabriel da Cachoeira.

Objectives

- To build capacity among Brazilian research institutes to research, catalogue, and mobilize data from biocultural collections, and to develop these important resources for improved understanding of the useful and cultural properties of plants.
- To build capacity among indigenous peoples to research and document traditional knowledge, combining techniques from standard scientific practice with indigenous perspectives.

Participatory research—The training program included four main elements.

1. Integrated collections research and knowledge transfer through hands-on research at Kew, working with Richard Spruce's collections from the Brazilian Amazon. Staff from JBRJ were trained in current methods of curation and community use of biocultural collections.
2. At JBRJ, building capacity for enhancement of an existing platform (currently focused on plant specimens—REFLORA), extending its value as a key Brazilian biocultural resource and opening opportunities for integration of data from other collections.
3. Capacity building in integrated collections research and mobilization among a range of Brazilian organizations, while strengthening interinstitutional collaboration and knowledge-sharing within Brazil (1-week training course delivered in Rio de Janeiro, applying Brazil- and UK-based expertise while drawing on specialist knowledge and expertise among the trainees).
4. Development of skills in autonomous biocultural research and interpretation/education among indigenous communities in the Upper Rio Negro, building on the Instituto Socioambiental's existing program in the region. The main activity was a training course for indigenous researchers held in São Gabriel da Cachoeira. Richard Spruce's collections, many of which originated from this region, were used as

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Box 1 (continued)

source material for part of the training, alongside a focus on contemporary material culture and plant use. The workshop in São Gabriel da Cachoeira was followed by a 5-month field research program, supported by ISA, assisting indigenous trainees to put their new learning into practice in the context of projects focused on sustainable resource use, and documenting/valuing traditional knowledge and practices.

4 Plant Identification

Identification of plants used in the production of biocultural collections requires a *numbered* voucher specimen (preferably housed permanently in a herbarium) relating to the occurrence of a plant in a given place, its respective indigenous names, and its uses [8]. Ideally the plant should be fertile (e.g., with flowers or fruits), as this can help taxonomists identify the species. It is useful to produce high resolution photography of the plant, not only to assist taxonomists but also because these may be used in displays, publications, and materials for local communities. Carefully photographing the plant collections in a systematic process (e.g., photographing the environment; the whole plant; part of the plant with leaves and flowers/fruits; leaves; flowers; fruits; seed; bark) is important. With access to a digital scanner, plants can be scanned and sent quickly to botanical experts. Avoid mixing up photos of plants: one suggestion is to take a first picture of just the collecting number, and then of the plant images relating to it. Also, it is best to note the photo numbers on the specimen data form. The unique specimen voucher number should be connected to *all* related data: notes, recordings, biocultural collections etc., assuring the quality of the botanical identification. Richard Spruce was a pioneer in collecting herbarium voucher specimens in connection with artifacts, and recent work at Kew has enabled ethnobotanical specimens to be reconnected with herbarium material and correctly named, despite the passage of 170 years.

5 Raw Materials and Manufacture

Biocultural collections have a strong emphasis on the type of raw material utilized (fibers, dyes, fruits, seeds, inner bark, exudates, etc.). It should be collected with data on selection criteria for the plant, when and how it was collected (e.g., perennially or seasonally); who collected the plant (men or women); what procedures were used after gathering (washed, ground, sun-dried or shade-

dried, storage techniques, etc.); and how it is transported. In relation to the plants providing the raw materials, further data include: the name of the location where it was encountered, its characteristics (life form, height, odor, taste, color, and texture of its flowers, leaves, fruits, bark; presence of exudates, etc.), location (upland forest, várzea, etc.), if the plant is abundant or rare (its conservation status), and the part of the plant that is collected. If the raw material was obtained by another person, it should be noted whether it was given or purchased, and in the latter case, its price. It is also useful to record which other plants can be used for a given purpose, as well as those being immediately gathered.

Recording the making of an object should be done through drawings, photographs and/or video recordings, embracing all phases of production. If possible, the object should be recorded at its various stages of completion, concentrating on the 'points of transition' [8]. Yet beyond these technical aspects of the fabrication process, it is equally important to inquire about the sociocultural aspects associated with the crafting of the artifact. Research should document who made the artifact (men, women, young, elderly, clans, age groups, etc.), including gender, generation, and social organization. In this respect, it is very important to document if the person elaborating the artifact are observing dietary and sexual taboos, among other acts. It is also important to inquire about where and when the artifact should be made, its appropriate space (domestic, ritual, natural environment) and timing (season, moon, ritual calendar, etc.). It is vital that the name and its meaning or significance is recorded in its local language, and if it is made with various parts, also note their respective names [2].

6 Documenting the Use of Artifacts

One of the first tasks is to identify the type of use designated for the object, addressing diverse categories (domestic, body ornamentation, musical instruments, toys, ritual uses, among others). Object use is also associated with gender (men, women), generation (young, elderly, others) and social organization (clan, age grade, etc.). It is also important to indicate who uses the artifact (men, women, clan or specific social group, age), and in the case of objects specifically used in rituals, restrictions or prohibitions in handling them. In the northwestern Amazon, there is an artisanal specialization among ethnic groups [9]. For example, the Tukano specialize in the manufacture of wooden benches, the Tuyuka and Bará in the fabrication of canoes, the Hupda in making the baskets used to carry cassava, and the Desana and Baniwa in basketry of various types and uses. Curare poison is made by the Maku peoples and the Makuna. Likewise, one should register: special uses and

preparations; when to use; how they should be employed; and for what end.

Another aspect that should be documented regarding ritual objects is whether they should be used alone, or in combination with other objects to give them cultural significance. Various types of objects and instruments can be used together in certain contexts. For example, in the northwestern Amazon, ornaments used in ceremonies are composed of several parts that are stored together in a box made with the sewn fibre. This fibre is derived from the leaves of a palm tree which has a very restricted distribution across the region.

With this, we emphasize the importance of recording as much detail related to the object and especially its cultural meanings, such as ceremonial use objects. We need to be careful in the record, exemplified by a testimony (current) of a Tukano Indian, who reported that he was shocked when he saw a Tukano bench—an important object in their culture, where the elders sit down to tell stories—in the bathroom of an apartment in São Paulo. We need to register, transmit and respect the local cultural significance of the objects.

7 Documenting Biocultural Collections

Biocultural artifacts exhibit two interrelated dimensions that need to be studied, analyzed, and documented in the research process, namely, the biological and cultural dimensions. The biological dimension is primarily linked to the raw materials, mostly from plant material (wood, leaves, fiber, resins, oils, etc.), and animals (feathers, bones, teeth, hides, and skins) comprising these objects. Occasionally, though currently infrequently in the northwest Amazon, artifacts can also consist of human material (hair, teeth, and bones).

Documenting cultural artifacts aims to situate and contextualize objects in the world in which they were produced. In this sense, an ethnographic approach can document sociocultural aspects associated with these objects: "a classic analysis of ethnographic objects embraces four main aspects: raw materials, crafting techniques, their formal aspect, and functions" [10]. As such, as pointed out by van Velthem, "it is unfathomable to study artifact without considering their aesthetic and economic aspects as well as their epistemological significance" [10]. Likewise, Silva and Gordon [11] propose analyzing the "material, environmental, historical and significant" aspects of these objects.

The cultural dimension is related to human intervention in the process of crafting the artifact; this involves a series of interactions and knowledge beginning with the selection of raw materials and their extraction from the environment, handling, the techniques

involved in crafting and finishing, their social dimension in craftsmanship, utilization and meaning of the artifacts, considerations in the shelf life, the agency and potential of these objects. Objects occupy a special place in Amerindian cosmology, with qualities that go beyond materiality such as agency and power [12]. These attributes need to be documented, by interviewing people working on these objects and those familiar with myths and tales that detail the origins of these artifacts. Questions about narratives, chants and associated rituals, and their importance in the lives of indigenous people should also be addressed. In this way, it is possible to unearth the ontological dimensions of these objects, their aesthetic qualities, and features contributing to their beauty.

In collaborative research on ethnographic objects with indigenous peoples of the Amazon at the Goeldi Museum (Belém), "conversations about objects" are generally initiated by documenting raw materials followed by production aspects of the objects, considering the person involved in crafting it and the descriptions about elaboration techniques. In turn, details are provided about the use of the object, who utilizes it, how it is used, why it is used, if it is still in use, and if there is a history or narrative associated with it [13].

8 Digital Repatriation and Indigenous Knowledge

Digital repatriation projects may promote the safeguarding of indigenous knowledge through the integration of scientific documentation, notes, images and vouchers (botanical material). This kind of dynamic, complementary, and integrated data may reinvigorate traditional practices and maintain the culture and the ways of life. This may have an impact on technological changes and cultural needs on individual communities, as well as regional and international networks (Box 2).

Box 2 Example of repatriation and sharing of information previously stored in scientific collections:
The *REFLORA Project*, in which Kew and JBRJ are major partners, has made great progress in repatriating important botanical collections and data held outside the country, contributing to the development of greatly enhanced understanding of Brazil's plant diversity. The project initially focused on herbarium specimens collected in Brazil but now housed in museums around the world. However, its scope has now increased to include the 300 ethnobotanical artifacts collected by Richard Spruce and housed in Kew's Economic Botany Collection. In

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Box 2 (continued)

future it may expand to include manuscripts associated with Spruce and other past botanists.

The data and images of artifacts and plant samples have been repatriated and are now accessible on a free platform—the Herbario Virtual Reflora (URL link to reflora.jbrj.gov.br), being made available digitally to the descendants of the peoples visited by Spruce for more than a century, as well as the public in general.

The research on the Rio Negro reported here has also disseminated results to different audiences in other ways:

- A training manual on biocultural research, published initially in Portuguese, the Manual de Etnobotânica: Plantas, Artefatos e Conhecimento Indígena [8] (also available online), is now being translated into Tukano and Baniwa languages. In addition to giving visibility to this pioneering research program, the manual responds to the requests of local indigenous schools and organizations for research tools to develop their botanical knowledge.
- A video based on the footage shot at the São Gabriel da Cachoeira workshop and in the Kew collections. Luciana Martins and the Derek Jarman Lab at Birkbeck, produced a video entitled The Many Lives of a Shield (available online at vimeo.com/194984574). Cross-referencing Kew sources including manuscripts, herbarium samples and publications, the video provides glimpses of the stories told by the peoples of the Rio Negro about the ceremonial shield and the raw materials used to produce it, including the cosmologies associated with them. They also produced a video documenting the main activities of the workshop (vimeo.com/201827169).
- An exhibition at Kew's Shirley Sherwood Gallery of Botanical Art entitled "Plantae Amazonicae" by Kew artist-in-residence Lindsay Sekulowicz. Supported by Arts Council England, the exhibition ran from October 2017 until March 2018 to record audiences (>75,000). The exhibition represented Sekulowicz's own encounters with Spruce's ethnobotanical artifacts, herbarium specimens, and notebooks. Her artworks were juxtaposed with indigenous objects (including the shield video) and Spruce's field observations. The exhibition made tangible to a non-indigenous, international audience the link between Amazonian plants, artifacts, history, indigenous knowledge, and contemporary art.

9 Notes on Fieldwork

The majority of researchers who are interested in ethnosciences have either received a training in an 'exact' science, like botany, or a training in a social science such as anthropology. Few have received training in both spheres of science. A good ethnoscientist needs to be an autodidact, to fill up the gap in formal education. Seeking council from a specialist in the other sphere of sciences is advisable. This is especially the case for a researcher with a training in exact science. The basics of botanical science are pretty much the same the world over, but local cultures can vary greatly, even among neighboring groups.

Practical tips can be acquired through conversations with people who have worked and/or lived with the people of the culture that are being studied. If the aspiring ethnoscientist wants to acquire an object, or indeed some fresh food, what should he pay for it with? Barter, money, or both. If barter can be used, what type of goods can be used? If money, what is the average value of a basket, a fish, or a pineapple? If offered a drink during a party, can you refuse, must you drink the whole cup, or can you just take a sip? This is valuable information and will not normally be found in the literature.

Of course, permission must be obtained from the institutions representing the state, but also from the leaders of the local communities. It is a mistake to think that official permission is enough. Even when in contact with local 'leaders', it is possible that they do not have real authority (in the sense that they can command). The 'spokesman' of a culture, communicating with the outside world, are often people who speak the official language of the country (e.g., Spanish or Portuguese) and have received some non-traditional education (e.g., a schoolmaster). This does not necessarily mean that they are the leaders. Always try to explain, as often as possible, what you are intending to do, preferably in community meetings.

Who owns the traditional knowledge from local communities, and how can it be used? This is a complex problem, which is now governed by interdisciplinary protocols (e.g., Convention on Biological Diversity, Nagoya Protocol), national research rules, and local peoples. This is a complicated area. The "maker" of a biocultural collection may own it, be happy to share his knowledge, and be happy to trade it. Others, from the same community, may see this information as a key part of their culture, requiring a wider decision regarding intellectual property rights. Prior Informed Consent is important for working with local peoples, but *who* should sign it is another question. And how should the data be used? Ideally a full, collaborative partnership between scientists and local peoples, with clear protocols and outputs, should be clear at

the start. Where should biocultural collections be located (e.g., museums), and/or should they be kept in the community? How can the data help support education, health, nutrition, sustainability, and incomes? How can previous collections and data (e.g., those collected by Richard Spruce) be used to support the outcomes? How to present the data in a format that is useful, and comprehensible?

Collecting plant specimens usually requires a permit, at least in scientific research. You can collect them, photograph them, scan them, make objects from them... but modern herbaria require authorisation. For local people involved in collaborative research, you therefore probably need to involve a trained botanist. Taking specimens away for identification is important, but ideally one should keep duplicate specimens within the community. This is difficult, particularly in humid areas without electricity. Producing high-resolution images of the specimens may be preferable.

Collecting herbarium specimens as a 'voucher' for ethnobotanical recording should, ideally, be stored permanently in the Herbarium. In the future, another researcher (taxonomist, ethnobotanist, botanist) can check the identification in accordance with the new or updated taxonomies. However, in some cases the voucher may be sterile (without flowers of fruits). In most cases these sterile specimens can be identified to species, but many herbaria will not them in the collection. Storing them in boxes on the office may work (for a while), but eventually they will probably be thrown away. One answer is to scan the specimens (at high resolutions) and then store them on an institutional database or website. Ideally, a multi-institutional database for ethnobotanical vouchers could be set up, allowing us to compare the collections and uses between other researchers.

Aspiring ethnoscientists, working with local people, must not fall in the trap of seeing the people of the culture as mere 'informants'. Seeing "traditional" people as coworkers is more efficient, more revealing, and more respectful. Seeking informal conversations while eating, resting, or preparing to sleep can reveal insights and information that will not appear in formal interviews. Explaining the scientific perspective of the things, alongside "traditional" explications, can be useful to establish a more informal relationship with local coworkers. Paying locals for gathering data may be problematic, as others in the community may feel they are left out. However, by trying to engage more people in the research (albeit not as coworkers) may help to resolve this. Indigenous people are often very interested in "western" knowledge, and eager to learn more about this, though this does not mean that the scientific explanation will be accepted without questioning.

In the present day of scientific research, field periods are rather short. Gone are the days of the naturalist (e.g., Spruce and Bates) where researchers stayed many months or even years in the field. It

takes time to establish a more relaxed working relationship with local people, to dismantle initial distrust, to work out the right methodology of research, and to find out the nuances of a certain culture. Perhaps the best method to overcome this problem is to try to join one project proposal with another, creating a string of projects with the same people working on the same or similar objects/subjects. If possible, the first project should be more educational-orientated than science-orientated.

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